

Appraisal of Tuberculosis Case Finding

—Des Moines and Polk County, Iowa—

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IN an area and time in which the discovery rate of active tuberculosis is low, it is important to study present methods of case finding and diagnosis for program guidance.

How such a diagnosis becomes attached to a particular patient was the subject of a study of the tuberculosis control program in Polk County, Iowa. Our primary interest was in the succession of events leading to the definitive diagnosis among the 83 persons found to have active tuberculosis during the 2 years 1952 and 1953. The survey was undertaken in order to discover also to what extent the major case-finding methods were responsible for the diagnosis, the failures of accepted methods, some reasons for those failures, what might improve the application of current methods, and finally, whether new approaches should be introduced?

Des Moines and Polk County, Iowa, with a population of some 235,000 persons, have had a tuberculosis incidence pattern comparable to that in the rest of the State of Iowa. One health official directs the Des Moines City and Polk County Health Departments. The county

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hospital has a tuberculosis unit of 87 beds. The medical director of the tuberculosis unit is responsible for the care and management of the patients during both their hospital and out-patient care.

Organized community case finding for tuberculosis operates in three major areas:

1. Screening: By use of a mobile X-ray unit, concentrated on industrial groups; and by tuberculin testing of segments of the school child population. During the past 5 years, some 66,000 photofluorograms have been made by the mobile unit. Two-thirds of these covered industrial groups. Annual tuberculin testing of Des Moines public school children is carried out in kindergarten and in the 9th and 12th grades. Each county school has its entire population tested every 4 years. Positive reactors in these groups have usually amounted to less than 6 percent for any age group.

2. Contact investigation: Each patient reported to have active tuberculosis is visited at home by a public health nurse, who applies tuberculin tests to members of the family and to others considered to be close contacts of the patient. The nurse arranges for chest X-rays of these individuals. She also makes a home visit whenever a miniature film report indicates a shadow suggestive of tuberculosis and advises the patient on the subsequent steps to be taken—a visit to the family physician or to one of the diagnostic clinics.

3. Prolonged followup of all persons known

to have had active tuberculosis: This is a regular function of the hospital's tuberculosis unit; for those patients who do not have legal residence in the county, the Christmas Seal clinic provides the service.

Of the 83 individuals with a diagnosis of active tuberculosis, only 7 (8.4 percent) were in the minimal stage, whereas 33 (39.8 percent) had moderately advanced tuberculosis, and 39 (47 percent) were considered far advanced. Four persons (4.8 percent) had extrapulmonary tuberculosis. Although a low discovery rate was anticipated in a low incidence area, the detection of only 7 minimal cases was of real concern.

Each patient diagnosed as tuberculous was visited by a specially trained public health nurse who was familiar with the objectives of the study. The nurse discussed with the patient and others close to him, and with the family physician and members of the hospital staff, the events related to the illness. The health department attempted to locate and review all previous X-ray films. Information was obtained concerning contacts and the results of their examinations.

A form was constructed to include this information, together with identification data; the motivation of the patient to seek medical care; a description of symptoms leading to diagnosis; place and date of diagnosis, stage and activity of the disease, and date of hospitalization; record of previous treatment for tubercu-

losis, including place, date, and outcome of treatment; and if previously reported as tuberculosis, date of report, county, or whether outside Iowa. If previous X-rays had been taken, the results and their interpretation were also entered on the form. Page 2 of the form provided space for data on contacts: name, age, and relationship to patient; tests for tuberculosis, with date and result of each test; miniature X-rays and 14" x 17" X-rays; diagnosis, whether previously known as having tuberculosis; and whether this tuberculosis activity was discovered by the present investigation.

Reasons for Coming to Diagnosis

Most of the patients (52 of the 83) came to diagnosis because of symptoms. Thus, approximately 60 percent of all persons with active tuberculosis were diagnosed because of a sense of illness which prompted them to seek medical care either in the office of the family physicians or in a special clinic. Two of the group with minimal tuberculosis, 20 of the moderately advanced and 27 of the far-advanced groups, and 3 patients with extrapulmonary tuberculosis were so motivated. In 9 patients, the diagnosis was made as a result of an examination which included a routine chest X-ray. Four cases were discovered because the patients were examined as contacts. Routine screening of hospital admissions at the veterans facility in Des Moines resulted

Table 1. Reasons for coming to diagnosis of 83 cases of tuberculosis diagnosed in Polk County, Iowa, 1952 and 1953

Stage of disease	Total cases	Reason for coming to diagnosis							
		Symptoms	Physical examination including chest X-ray	Contact investigation	Routine X-ray of hospital patients or employees	Hospital admission X-ray	Mobile unit X-ray	Follow-up of previously known tuberculosis	Post-mortem examination
Pulmonary:									
Minimal	7	2	1	0	2	0	1	1	0
Moderately advanced	33	20	5	2	1	3	0	2	0
Far-advanced	39	27	2	2	0	0	2	3	3
Extrapulmonary	4	3	1	0	0	0	0	0	0
Total	83	52	9	4	3	3	3	6	3

Table 2. Time interval from onset of symptoms or first suspicion of tuberculosis to definitive diagnosis

Motivation and diagnosis	Time from suspicion of tuberculosis to diagnosis (months)								Total
	<3	3-6	7-9	10-12	13-24	25-36	>36	Unknown	
Motivation:									
Symptoms.....	22	4	3	3	10	2	5	3	52
Contact investigation.....	4	0	0	0	0	0	0	0	4
X-ray screening.....	6	1	1	1	0	0	0	0	9
Post-mortem examination.....	0	0	0	0	1	1	0	1	3
All other.....	9	1	1	1	0	0	0	3	15
Total.....	41	6	5	5	11	3	5	7	83
Diagnosis:									
Extrapulmonary disease.....	0	1	2	0	1	0	0	0	4
Pulmonary disease:									
Minimal.....	5	1	0	0	0	0	0	1	7
Moderately advanced.....	20	2	2	4	4	0	1	0	33
Far-advanced.....	15	3	2	1	6	3	4	5	39
Total.....	41	7	6	4	11	3	5	6	83

in the discovery of 3 residents of Polk County with tuberculosis; and X-ray examination of hospital staffs and patients hospitalized for other disorders revealed another 3 cases. The mobile X-ray unit screening service supplied the first evidence of disease in 3 patients; 6 were found through followup of previously known tuberculosis patients, and in 3, post-mortem examination supplied the diagnosis (table 1).

In this group of patients, 52 were men, 31 women. Approximately equal numbers of men and women made up the moderately advanced classification; but in the groups with minimal and far-advanced tuberculosis, there were more men than women. The median ages in relation to stage of disease were: minimal, about 30 years; moderately advanced, about 45 years; far-advanced, about 55 years. Among those who sought medical attention because of symptoms, there were slightly more women than men in the group with moderately advanced tuberculosis, whereas in the group with far-advanced tuberculosis there were almost four times as many men as women.

For patients who came to diagnosis because of symptoms, the elapsed time between onset of symptoms and diagnosis varied considerably. However, there was no essential difference in this time interval between men and women;

about the same proportion were diagnosed within 3 months. Of the 83 patients in the study, the largest number (22) were diagnosed within 3 months from the date symptoms of tuberculosis were first noticed (table 2).

Nevertheless, the median time between onset of symptoms and diagnosis is over 6 months, with 19 persons having a delay of more than 1 year. Persons coming to diagnosis for reasons other than symptoms were usually diagnosed within 3 months. Two persons in whom the diagnosis was established at post mortem had a duration of symptoms of more than 1 year.

It is of some interest that, according to these figures, the interval from first evidence of the disease to establishment of the diagnosis increased with advancing stages of the disease. All of the minimal cases with definable duration reached diagnosis within 6 months, as did two-thirds of the moderately advanced cases and a little more than half of the far-advanced cases. It required more than a year from the estimated date of onset to develop the diagnosis in 5 of 33 moderately advanced cases and in 13 of 34 far-advanced.

Of the 20 cases of moderately advanced tuberculosis coming to diagnosis because of symptoms of tuberculosis, 10 had been observed for possible tuberculosis for more than 6 months. Of 7 persons with positive screening X-rays,

Table 3. Opportunities existing before definitive diagnosis in 52 patients with symptoms of tuberculosis

Previous opportunities for suspecting tuberculosis	Stage of disease				
	Minimal	Moderately advanced	Far-advanced	Extrapulmonary	Total
Number of opportunities.....	0	14	18	2	34
Symptoms diagnosed as other disease.....	0	3	4	1	8
X-ray misread.....	0	4	1	0	5
X-ray positive ¹	0	3	4	0	7
Contact ¹	0	3	3	1	7
Previous tuberculosis ¹	0	0	6	0	6
Positive tuberculin test ²	0	1	0	0	1
No opportunity.....	2	6	9	1	18
Total cases.....	2	20	27	3	52
Percent of total cases with previous opportunity for diagnosis.....	0	70	67	67	65

¹ Followup interrupted or not done.

² Followup interrupted.

only 3 had been suspected originally; 4 miniature films were reinterpreted as indicating possible tuberculosis.

Of 27 cases of far-advanced tuberculosis coming to diagnosis because of symptoms of tuberculosis, 16 had been suspected by the patient for more than 6 months, including 4 cases which had been for more than 3 years. Five persons had had previous miniature films, of which 4 had been read positive and 1 misinterpreted.

Missed Opportunities for Diagnosis

At least 12 persons had previous suspicion of tuberculosis which could have led to diagnosis. We reviewed the records for all cases in which symptoms motivated the person to seek diagnosis to determine if we could identify additional opportunities for diagnosis which had been missed. The findings are presented in table 3.

For minimal tuberculosis, we found no evidence that the disease could have been suspected earlier, but for moderately advanced, far-ad-

Table 4. Results of contact investigation of cases of active tuberculosis diagnosed in Polk County, Iowa, 1952 and 1953

Type and stage of tuberculosis	Number of source cases	Number of contacts ¹				
		Reported	Examined	Positive 14" x 17" X-ray	Active tuberculosis	
					New cases	Previously known cases
Pulmonary:						
Minimal.....	7	11	10	0	0	0
Moderately advanced.....	33	95	91	2	0	1
Far-advanced.....	39	135	124	7	2	0
Extrapulmonary.....	4	14	12	1	1	0
Total.....	83	255	237	10	3	1

¹ For purposes of this table a contact is defined as a case that could be located and does not include "source" cases, that is, persons who previously had reported the case as a contact.

vanced, and extrapulmonary disease, missed opportunities could be considered in two-thirds of the cases. Following is a recast of our interpretation of "missed opportunities."

1. "Symptoms otherwise diagnosed" included cases reporting to physicians with symptoms that might have been associated with tuberculosis as well as with the respiratory tract disease that was under treatment. The patients were ultimately diagnosed as active tuberculosis primarily because of the persistence of symptoms.

2. "X-ray misread" included cases in which rereading showed abnormalities which were "suspicious" of tuberculosis and which should have led to further followup.

3. "X-ray positive—followup interrupted or not done" included cases in which the "suspect" did not return for scheduled examination or in which for some other reason followup observation lapsed.

4. "Contact—followup interrupted or not done" included cases in which repeated examinations were not made frequently enough or in which investigation was not instituted.

5. "Previous tuberculosis" including "positive tuberculin test"—followup interrupted or not done. We feel that adequate patient education and followup should have led to a diagnosis of reactivation of disease before symptoms motivated the patients to seek medical care. In none of these cases was an X-ray performed within 3 years of the date of suspicion of active disease.

6. "None." This group includes patients found as a result of sudden hemoptysis, or with a history of vague, "unimportant" symptoms.

Contact Investigation

We have previously noted that four of the active cases of tuberculosis are described as having come to diagnosis because of contact investigation (table 1). Table 4 presents the results of contact investigation of the 83 active cases of tuberculosis diagnosed during the period. The number of contacts named and examined approximated three per patient. Three previously unknown cases of active tuberculosis were found through the examination

of 237 contacts. Many of these contacts had not had the opportunity to have repeated examinations at the time this tabulation was prepared and further cases may be discovered in subsequent months. The relationships of the three active cases to the source cases were wife, husband, and mother.

Discussion

In this group of patients, an average time lapse of about 3 to 6 months occurred between the onset of symptoms and the establishment of a diagnosis of tuberculosis.

Such a delay may be attributable partly to the patient himself, who may be slow to recognize the vague symptoms of fatigue, cough, and loss of weight as manifestations of tuberculosis. In this sense, the delay may, indeed, be implicit in the disease itself.

Conversely, the long interval between onset of symptoms and diagnosis may be a medical responsibility. However, the diagnosis of active pulmonary tuberculosis is not a simple decision and may be equally troublesome for the family physician and for the medical specialist. This is true when tuberculosis is the only disease to be considered. How much more perplexing is the problem when the disease occurs in the course of other long-term illnesses. In this respect, also, the stage of the tuberculosis is the primary factor in the delay of diagnosis.

To remedy the delay in diagnosis, we must advocate repeated careful searching examination of the patient, with the possibility of tuberculosis constantly in mind. And for the patient, we urge earlier visits to the physician as soon as he is aware of ill health.

Because of our low tuberculosis rate, we must also emphasize case-finding measures which reach the groups with the highest prevalence of tuberculosis. Additional community control measures that may be applied are the X-ray screening of certain groups, such as transients, welfare department clients, old-age assistance beneficiaries, and persons interned in prisons and jails. The members of families and other close contacts of patients can be examined at regular intervals. As school populations are tuberculin tested, families and close associates of reactors may be similarly treated.

Perhaps the only major mechanism lacking for more complete case finding is the establishment of a "suspect registry." This registry would include all individuals who react to the tuberculin skin test, and all those who have suspicious, though stable, X-ray findings. Such a proposal is based upon the assumption that anyone who has had a tuberculous infection has within him the potentiality for subsequent active disease. With reporting centralized in a health department, these individuals could be followed at regular intervals by an official

agency. They could also be impressed with the importance of disclosing their status to the physicians whom they may consult for other reasons. Operation of this plan over a number of years would develop a vast group to be held under observation. The plan is feasible only in a population with a low incidence of infection. Many small communities and some entire States present such a situation today, and it is in these areas that tuberculosis case-finding techniques could be augmented by the addition of a tuberculosis suspect registry.

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